innegram Fall 2015

Director's Corner

A message from WRC Director Jeff Peterson

Call for abstracts: 2016 WRC annual grant competition

Features

New WRC Director has roots in agriculture, branching out to include water quality protection

"I realized that I was not missing milking cows twice a day, seven days a week," says new Water Resources Center Director Jeff Peterson, explaining in part, how he migrated from studying dairy science to agricultural economics. Peterson grew up on a typical mid-eighties dairy farm outside of Osseo in western Wisconsin; 40 cows, with 200 acres of farmland. He wanted to stay on the farm and his parents insisted on college so he majored in dairy science at the University Wisconsin- River Falls. While there, he accepted an internship in a lending agency within the USDA and he found that he enjoyed the work. An advisor suggested that he add some agricultural economics courses to his studies which eventually led to switching majors, and leaving farm life behind.

Water resource research, management on tap at upcoming Water Resources Conference

The 2015 Minnesota Water Conference returns to the St. Paul RiverCentre October 13-14, 2015. The Water Resources

Center hosts the annual conference which presents innovative water resource engineering solutions, management techniques, and current research. Plenary topics this year include findings from Chesapeake Bay nutrient management, NOG and industry efforts in water stewardship and environmental impacts of fracking. Concurrent sessions throughout the day will offer information on engineering projects, water research, best practices in design and application of water resource management methods, water policy and emerging issues

David Fairbairn moves from WRS student to MPCA scientist, contributing critical research along the way

Now a research scientist with the Minnesota Pollution Control Agency, David Fairbairn received his doctorate in Water Resources Science in June 2015. Interested in the connections between environmental chemistry and the health of humans and broader biological communities, Fairbairn received his Master of Science degree in Environmental Public Health from the University of Wisconsin-Eau Claire in 2008 and worked as an environmental health specialist before entering the WRS program in 2009.

New Wild Rice Survey Protocols Released

Two recently released publications provide resource managers with the methods and rationale to estimate annual wild rice biomass, density, and productivity. Responding to a need for accurate, reproducible field sampling protocols for wild rice, author Tonya Kjerland wrote the Wild Rice Monitoring Field Guide and the Wild Rice Monitoring Handbook as part of with her graduate work in Water Resources Science at the University of Minnesota. The project drew upon the expertise of tribal biologists, tribal community members, and university researchers to create scientifically-defensible methods that are responsive and respectful to the beliefs of Native American, First Nations, and like-minded peoples.

Fall 2015 Community News

Fall 2015 Student News

Fall 2015 Resources and Publications

Fall 2015 Upcoming Events

Fall 2015 CrossCurrents-Links to other water-based websites

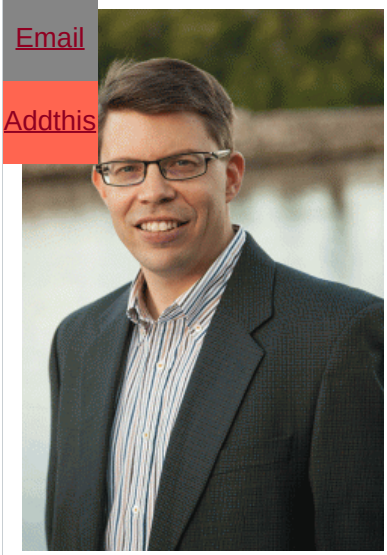
Minnegram

- Minnegram Spring 2015
- Minnegram Winter 2015
- Minnegram Fall 2014
- Minnegram Summer 2014

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu

rector's Corner Fall 2015



I am excited to begin my new role as director of the Water Resources Center. During my first few weeks on the job I have enjoyed meeting many people involved in the diverse array of water resource issues in Minnesota. These discussions have deepened my appreciation for the many bonds between Minnesotans and the water resources surrounding us. I have many more people yet to meet and look forward to hearing more of these stories.

I feel both grateful and humbled to start this job following the distinguished leaders who have built this center into what it has become. I owe a special thanks to Faye Sleeper, who led the center capably as interim director for over a year and helped me make a smooth transition. Faye will continue to be part of the center's leadership as associate director. She will be overseeing many of our outreach functions, in addition to working with me to guide future directions of all center programs.

I would also like to recognize and thank Deborah Swackhamer, who led the research, graduate education, and policy outreach activities in the center as co-director until 2014. Deb has been most gracious and helpful to me as I learn about water resource issues in Minnesota and center activities. Her contributions to both scientific and policy discourse will be long remembered – the sort of legacy left by very few.

Faye and Deb developed effective programs to address the ever evolving set of water resource issues in our region. As I went through the hiring process, one of many attractive features of the job was the knowledge that University Extension and the College of Food, Agricultural and Natural Resource Sciences both recognize the value of the center's programs and see work on water resource issues a future priority.

Those of us working on water resource issues find ourselves in both a challenging and exciting time. Needs are great and unresolved questions abound, but we also have an opportunity to make lasting impacts. In the coming months, we will be going through a visioning and planning process in the center to identify our priorities and develop strategies to maximize our impacts and value. Our success, now and in the future, hinges on strong connections with our partners and the many

audiences of our programs. I look forward to these ongoing conversations and always welcome your ideas about the center's programs and opportunities to improve them. Please contact me any time at jmpeter@umn.edu.

I hope to see you at the Minnesota Water Resources Conference on October 13 and 14. The program has shaped up to be excellent. This will be a perfect opportunity for me to further connect with the people dedicated to our water resources.

Main menu

- Home
- About Us
- Our Work
- Training
- News/Events
- Publications
- Extension Water Resources
- WRS Graduate Program
- Water Topics

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu

ew WRC Director has roots in agriculture, anching out to include water quality protection

zed that I was not missing milking cows twice a day, seven days a week," says new Water Resources Center Director Jeff Peterson, explaining in part, how he migrated from studying dairy science to agricultural economics. Peterson grew up on a typical mid-eighties dairy farm outside of Osseo in western Wisconsin; 40 cows, with 200 acres of farmland. He wanted to stay on the farm and his parents insisted on college so he majored in dairy science at the University Wisconsin- River Falls. While there, he accepted an internship in a lending agency within the USDA and he found that he enjoyed the work. An advisor suggested that he add some agricultural economics courses to his studies which eventually led to switching majors, and leaving farm life behind.

As Peterson and his wife Hikaru earned their masters and PhD degrees at Cornell, his interests evolved from farm management to agricultural production and its effects on water quality. His thesis examined the use of nitrate fertilizer in New York and how to mitigate its effects. Following the completion of their degrees two faculty positions were offered to them at

Kansas State University.

While his appointment was in Natural Resource Economics, Peterson soon realized that water scarcity was the larger issue, and focused his attention there. “I really enjoyed the interdisciplinary interaction with other departments as we collaborated on the water resources issue, from all these varied areas of knowledge and expertise.”

When the opportunity to lead the Water Resources Center surfaced, Peterson saw a chance to put all those pieces into play. Within the University, he wants the Center to be known as a place for faculty and students to go for ideas and support, while offering collaboration and connections to outside stakeholders.

Outside of campus, Peterson wants the Water Resources Center known as the go-to resource for all things water; a place to facilitate discussion among all invested parties, sharing views on water issues in an atmosphere of openness, respect and goodwill. “I would like the Water Resources Center to be considered a good ambassador, bringing various groups together to discuss water research, policy and economics. We need to encourage conversation, and perhaps more importantly, listening.”

Main menu

- Home
- About Us
- Our Work
- Training
- News/Events
- Publications
- Extension Water Resources
- WRS Graduate Program
- Water Topics

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu

ater resource research, management on tap at coming Water Resources Conference

015 Minnesota Water Conference returns to the St. Paul RiverCentre October 13-14, 2015. The Water Resources Center hosts the annual conference which presents innovative water resource engineering solutions, management techniques, and current research. Plenary topics this year include findings from Chesapeake Bay nutrient management, NOG and industry efforts in water stewardship and environmental impacts of fracking. Concurrent sessions throughout the day will offer information on engineering projects, water research, best practices in design and application of water resource management methods, water policy and emerging issues. There will be a poster session on the first day of the conference and industry vendors will staff exhibits throughout both days.

Tom Schueler

Tom Schueler *Managing Nutrient Reductions at the Watershed Scale: Some Early Lessons from the Chesapeake Bay TMDL.* For over 30 years, Schueler has applied practical stormwater practices, protecting and restoring urban watersheds. He directs the Chesapeake Stormwater Network, a non-profit organization devoted to implementation of sustainable stormwater practices across the Chesapeake Bay watershed. Schueler also directs the Chesapeake Bay Stormwater Training Partnership, which provides webcasts, workshops and on-line training modules to train engineers on new practices.

Lawrence Wackett *Fracking and the Nexus of Water and Energy.* Wackett is a Distinguished McKnight University Professor in the Department of Biochemistry, Molecular Biology and Biophysics at the University of Minnesota. He holds joint appointments in the Biotechnology Institute and the Department of Microbiology. He obtained his M.S. degree in Microbiology at Louisiana State University in Baton Rouge and his Ph.D. in Microbiology at the University of Texas at Austin. In 1987 Wackett became an Assistant Professor at the University of

Lawrence Wackett

Minnesota. Professor Wackett studies microbial biodegradation and biocatalysis in his research.

Lisa Kushner

Lisa Kushner *Creating Shared Value - Advancing Water Stewardship through NGO/Industry Collaboration.* Kushner is a member of The Nature Conservancy's Corporate Engagement team, where she manages corporate strategy and private-sector partnerships that focus on the intersection of water stewardship and agriculture. Kushner also manages the Conservancy's internal due diligence and review process for work with the private sector. The Conservancy views corporate engagement as a tool to achieve conservation outcomes and works with companies to incorporate the value of nature into their business decisions. Prior to joining the Conservancy's corporate engagement team, she spent several years in non-profit philanthropy and economic consulting. Lisa has a B.A. in Economics and a M.S. in Environmental Sciences and Policy from the Johns Hopkins University.

Ellen Silva

Ellen Silva *Creating Shared Value - Advancing Water Stewardship through NGO/Industry Collaboration.* Silva has held a variety of roles in her 18 years at General Mills, Inc. She has has developed Yoplait yogurt and Progresso soup, led nutrition science projects as well as developed nutrition strategy while a member of the Bell Institute of Health and Nutrition, helped change company innovation models while a member of the corporate connected innovation team, and led development efforts in many areas of ingredient and process technology as a manager in GTECH, the corporate central research team. She currently holds the role of Applied Sustainability Senior Manager on the Global Sustainability team, where her focus is watershed stewardship strategy implementation and packaging sustainability. Silva earned a B.S., M.S., and Ph.D. in Chemical Engineering from the Ohio State University.

Len Price *Reflections on Water.* Price has been the Executive Director of Conservation Corps Minnesota and Iowa since 2005. This non-profit, like the CCC-Civilian Conservation Corps, engages youth and young adults in hands on

Len Price

outdoor natural resource work. Prior to his current position, he taught high school social studies for 34 years, retiring in 1999 after teaching in the South Washington County School system. He served in the Minnesota State Legislature for 20 years; 1983-1990 in the House and 1991-2002 in the Senate. During his service in the Senate, Len chaired the Environment, Natural Resources and Agriculture Budget Division of Finance. He has also chaired State Government Finance & Budget Division and the Legislative Water Commission created by the 1989 Minnesota Groundwater Act. He authored many water related bills.

The Minnesota Water Conference is sponsored by the Water Resources Center and the College of Continuing Education, University of Minnesota, and co-sponsored by the Department of Civil, Environmental, and Geo-Engineering, College of Science and Engineering, University of Minnesota, Minnesota Section, American Society of Civil Engineers Minnesota Sea Grant College Program, University of Minnesota and the Natural Resources Research Institute, University of Minnesota.

Main menu

- Home
- About Us
- Our Work
- Training
- News/Events
- Publications
- Extension Water Resources
- WRS Graduate Program
- Water Topics

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu

avid Fairbairn moves from WRS student to PCA scientist, contributing critical research ong the way

A key part of the Water Resource Center's (WRC) mission is to educate the next generation of water professionals. Through its Water Resources Science Graduate Program (WRS), WRC graduates between 15 and 20 students on the Twin Cities and Duluth campuses every year.

Most of these students go on to become leaders in Minnesota's water resource management—and some establish themselves as important researchers from the start.

Now a research scientist with the Minnesota Pollution Control Agency, David Fairbairn received his doctorate in Water Resources Science in June 2015. Interested in the connections between environmental chemistry and the health of humans and broader biological communities, Fairbairn received his Master of Science degree in Environmental Public Health from the University of Wisconsin-Eau Claire in 2008 and worked as an environmental health specialist before entering the WRS program in 2009.

MPCA Scientist David Fairbairn in his element

As a new doctoral student at the University, Fairbairn served as research assistant and author of several background papers for the groundbreaking Minnesota Water Sustainability Framework, a comprehensive roadmap for Minnesota's water resources presented to the Minnesota Legislature in 2011.

On the heels of the Framework project, Fairbairn's primary doctoral research project—studying the of sources of contaminants of emerging concern (CECs) in the Zumbro River watershed—was awarded a grant by the Legislative-Citizen Commission on Minnesota Resources. This project was proposed by former WRC Co-director and Environmental Health

Sciences Professor Deborah Swackhamer, who served as the project's principal investigator and Fairbairn's primary advisor; William Arnold and Paige Novak, professors in the University's department of Civil, Environmental, and Geo-Engineering; and Pamela Rice and William Koskinen, scientists with the U.S. Department of Agriculture's Agriculture Research Service and adjunct professors in the University's department of Soil, Water and Climate.

Fairbairn's interest in environmental chemistry, ecology, and public health spurred his interest in contaminants of emerging concern (CECs), which include a broad range of hormones, pharmaceuticals, and other chemicals associated with residential, commercial, agricultural, and industrial products and activities. These chemicals are not commonly regulated in the environment but may cause deleterious effects such as endocrine disruption in aquatic and human systems, even at trace concentrations.

The South Fork of the Zumbro River, which winds through southeastern Minnesota and the City of Rochester, is associated with a variety of land uses within its watershed. With its urban and suburban landscapes, cropland, pastures, and hardwood forests, this study area offered an ideal venue in which to research the sources, transport, and delivery of CECs in a complex regional ecosystem.

Fairbairn and co-workers employed a range of techniques and equipment to collect more than 400 automated, passive, and grab samples of water and sediment for CEC analysis that together represent approximately 100 days from January 2011 to November 2012. In-stream flow and other parameters were measured with equipment deployed by the research group, along with existing stream monitoring equipment maintained by the U.S. Geological Survey, the Minnesota Department of Natural Resources, and the Minnesota Pollution Control Agency. Sample collection and processing, laboratory analysis, data processing and other key work was completed with the assistance of several WRS graduate and undergraduate students and staff.

Fairbairn's study included some surprises. "We found some CECs where you might not expect to find them —including highly soluble chemicals like caffeine and acetaminophen occurring in the river sediments," he says. "We also found the commercial-industrial chemical nonylphenol, not only in the urban areas where it would be expected, but also in a small and primarily agricultural area of the watershed. Although nonylphenol is primarily considered an urban contaminant due to its common use as a detergent surfactant, it is also used in some pesticide formulations, which may explain this agricultural occurrence. "

The statistician in Fairbairn is also pleased that their methodology was on the mark: "We were able to statistically test the mass balances for 16 CECs using seven sampling events at the same four sites. For the majority of our chemicals, the downstream loads were well explained by the combined inputs of Rochester's wastewater treatment plant and the other upstream areas. This reinforces the observed links between CEC occurrences and land uses in the region—because we showed that CEC concentrations vary with land use, while also showing that we accounted for the lion's share of these CECs' sources."

Fairbairn hopes his doctoral research will inform policy and management to better understand the measurement, transport, and impact of CECs on Minnesota's watersheds. "This study doesn't say what kind of deleterious things are happening," he says. "But it can help identify and predict in-stream CEC patterns based on land use, location, time, and type of sample.

Paired with knowledge of CEC effects, this research can help us understand exposures and target mitigation actions."

He describes his study as, "the single greatest educational and professional growth experience I'd ever had." More importantly, he says he's grateful for the chance to work side-by-side with some of the country's leading researchers: "The team I worked with was just incredible—it's an invaluable experience that I'll never forget."

Main menu

- Home
- About Us
- Our Work
- Training
- News/Events
- Publications
- Extension Water Resources
- WRS Graduate Program
- Water Topics

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu

ew Wild Rice Survey Protocols Released

ecently released publications provide resource managers with the methods and rationale to estimate annual wild rice ss, density, and productivity. Responding to a need for accurate, reproducible field sampling protocols for wild rice, Tonya Kjerland wrote the Wild Rice Monitoring Field Guide and the Wild Rice Monitoring Handbook as part of her graduate work in Water Resources Science at the University of Minnesota. The project drew upon the expertise of tribal biologists, tribal community members, and university researchers to create scientifically-defensible methods that are responsive and respectful to the beliefs of Native American, First Nations, and like-minded peoples.

The Handbook is a comprehensive reference for resource managers and researchers to use in designing wild rice surveys. The Field Guide is a condensed version designed to support field crews. The methods are applicable to wild rice stands across the Great Lakes region.

“The project aims to support cooperation in data gathering and analysis across political and organizational boundaries by providing a set of shared methods,” said Kjerland. “It facilitates pooling of our resources to monitor harvests and to answer important ecological questions.”

In early August, in time for the wild rice harvest season, Minnesota Sea Grant sent 80 copies of the Wild Rice Monitoring Field Guide to resource professionals throughout the Lake Superior basin as a tool to help manage wild rice populations. When asked how she plans on integrating the Wild Rice Monitoring Field Guide and the Wild Rice Monitoring Handbook into her job, Nancy Schuldt, Water Project Coordinator for the Fond du Lac Environmental Program said, “These documents are important in standardizing our approach to wild rice monitoring in this region. They set the benchmark not only for us at Fond du Lac but for other tribes who are just beginning to monitor their populations. We are also hopeful that these protocols will extend beyond the tribal approach.”

One feature that makes these protocols distinctive is the focus on wild rice, an annual plant that is significant for supplying food to humans and wildlife, as well as habitat. Many existing aquatic plant survey methods have a broader scope or a different purpose, such as assessing overall health of the water body or species diversity. While the variables for measuring wild rice are carefully defined, the protocols are also flexible. These methods are expected to be useful in a wide variety of

situations and they provide guidance about decisions such as the number and layout of sample points. One example of a decision managers will make when using these methods is whether to measure wild rice biomass using existing generic equations or by collecting plants. Using these new methods, biomass per area may be calculated by sampling variables that are relatively easy to measure such as plant height and stalk density. These computations are possible because the Handbook provides a generic equation that relates plant height to plant weight.

Funding for these projects was provided by The University of Minnesota Sea Grant Program, the 1854 Treaty Authority, the Fond du Lac Band of Lake Superior Chippewa, the Mille Lacs Band of Ojibwe, and the University of Minnesota. Both publications are available on the Minnesota Sea Grant website as downloadable PDFs. The Wild Rice Monitoring Field Guide is also available as a waterproof, spiral-bound manual for $2.50 (including shipping).

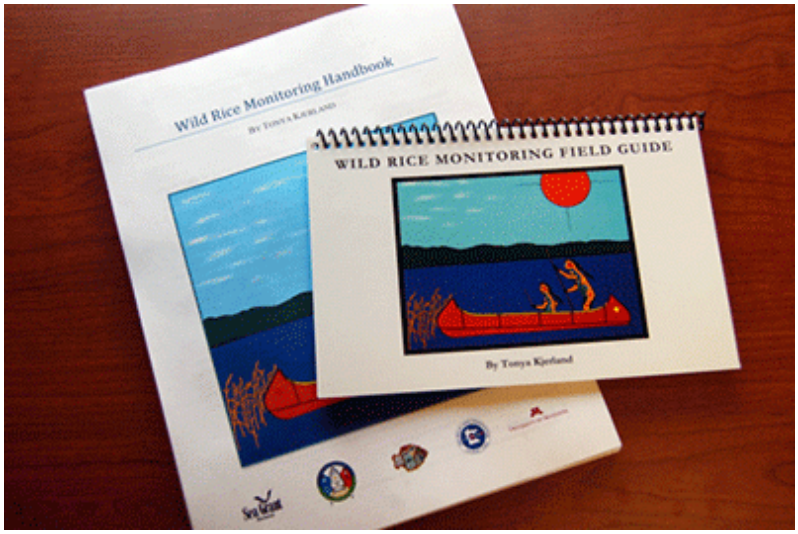


Photo credit: Chris J. Benson, Minnesota Sea Grant

Main menu

- Home
- About Us
- Our Work
- Training
- News/Events
- Publications
- Extension Water Resources
- WRS Graduate Program
- Water Topics

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu

ll 2015 Community News

M Extension Water Team (John Bilotta, Karen Terry, Eleanor Burkett and Doug Malchow) has created a classroom n of the Watershed game, *Building the Knowledge of the Leaders for Tomorrow*, designed for middle and high school nts in both formal and informal learning environments. Working in teams, students apply tools (practices, plans, and policies) to decrease water pollution while balancing financial resources. The goal of the activity is to reduce pollution from various land uses to the stream without going broke. This Watershed game classroom adaptation is designed to work within formal classroom environments with up to 32 students at a time. It features multidisciplinary educational lessons that address multiple education standards in science, social studies, and English language arts. For more information, visit the Watershed Game website.

Sara Heger WRC, OSTP, successfully defended her PhD dissertation *Evaluation of Four Milk House Wastewater Treatment Systems in Minnesota,* July 16, 2015. This project evaluated and demonstrated effective techniques and/or systems to reduce environmental pollution contained in dairy milk house wastewater and disseminated the results to dairy producers in Minnesota. Heger was advised by **Ed Nater**.

The University of Minnesota Duluth is pleased to announce that John A. Downing, an internationally prominent aquatic researcher and educator, has agreed to become the University of Minnesota Sea Grant College Program's director and a professor in the Department of Biology. Downing, who is beginning his directorship in January, is moving to Duluth from Iowa State University, where he is a Regent's Excellence Professor of Ecology, Evolution, and Organismal Biology and Chair of the Environmental Science Graduate Program. Downing is also the Chair of the Executive Board of the Council of Scientific Society Presidents and the immediate past-president of the Association for the Sciences of Limnology and Oceanography.

Main menu

- Home
- About Us
- Our Work
- Training
- News/Events
- Publications
- Extension Water Resources
- WRS Graduate Program
- Water Topics

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu

ll 2015 Student News

ing WRS student **Anna Baker** is the 2015 Smith Partners Fellow. The Smith Partners Sustainability Fellowship rts interdisciplinary study for Water Resources graduate students to pursue the connections between sustainable water ces management, economics, and public policy. The Fellowship affirms the University's commitment to sustainability initiatives through cultivation of interdisciplinary problem-solving, collaborative leadership, and public private partnerships. Baker is advised by **Jacques Finlay** and **Karen Gran.**

Nathan Campbell received his MS degree in July 2015. His thesis was titled: "Quantifying and characterizing the sedimentation reduction benefits of meander cutoffs in the Elm Creek basin in southern Minnesota." Campbell was advised by **Chris Lenhart.**

David Fairbairn received his Ph.D. in July 2015. His dissertation was titled: "Sources, Transport, and Sediment-Water Distributions of Contaminants of Emerging Concern in a Mixed-Use Watershed." Fairbairn was advised by **Deborah Swackhamer** and **Pamela Rice.**

Tonya Kjerland received her MS degree in July 2015. Her thesis was titled: "Wild Rice Monitoring Handbook and Field Guide." Kjerland was advised by **John Pastor.**

Rachel Olm received her MS degree in July 2015. Her thesis was titled: "Watershed-based planning in Minnesota: Strategies for prioritizing and targeting, and evaluating lag time implications for measurable water quality outcomes." Olm was advised by **Joe Magner.**

Mike Sorensen received a summer travel grant and will be presenting at the 2015 Ecological Society of America Annual Meeting on "Hypoxia tolerance of Bythotrephes longimanus and Leptodora kindtii." Sorenson is advised by **Donn Branstrator.**

Chakong Thao received his MS degree in July 2015. "Changes in fish community structure following crash of walleye population in Shoal Lake, Ontario, CA." Thao was advised by **Paul Venturelli**.

WRS PhD student **Seth Thompson** has been working closely with colleagues from the Mayo Clinic and University of Minnesota's Department of Biology Teaching and Learning to development environmental science education materials for the Integrated Science Education and Outreach (InSciEd Out) Program. This summer InSciEd Out will provide professional development focused on inquiry based environmental science curriculum for around 50 K-8 teachers across the Twin-Cities, resulting in new environmental science learning opportunities for over 1000 Minnesota students. Thompson is advised by **James Cotner**.

New Graduate Faculty:

Jeffrey Peterson- WRC Director- Peterson holds a Ph.D. and M.S. in Agricultural Economics from Cornell University and a B.S. in Agricultural Economics from the University of Wisconsin-River Falls. Peterson also has a faculty appointment in the Department of applied Economics.

Main menu

- Home
- About Us
- Our Work
- Training
- News/Events
- Publications
- Extension Water Resources
- WRS Graduate Program
- Water Topics

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu

ll 2015 Resources and Publications

iometric Flexibility in Diverse Aquatic Heterotrophic Bacteria Is Coupled to Differences in Cellular horus Quotas

in, C. M. and J. B. Cotner. 2015

Frontiers in Microbiology 62015): doi:10.3389/fmicb

We evaluated biomass C:P homeostasis in 24 strains of bacteria isolated from temperate lakes using a uniform relative growth rate in chemostats. Overall, the strains exhibited a range of homeostatic regulation from strong homeostasis to highly flexible biomass stoichiometry, but strains that were isolated using P-rich media formulations were more homeostatic than strains isolated using P-poor media.

Carbon:phosphorus Homeostasis of Aquatic Bacterial Assemblages Is Mediated by Shifts in Assemblage Composition Godwin, C.M. and J.B. Cotner. 2015

Aquatic Microbial Ecology 73, no. 3 (2014): doi:10.3354/ame01719

Several studies have noted a disparity between the stoichiometric regulation of bacterial assemblages and populations. In response to phosphorus availability, assemblages of bacteria often exhibit greater flexibility in their biomass carbon (C) to phosphorus (P) ratios (C:P) than axenic populations, some of which are homeostatic. We hypothesized that assemblages are inherently non-homeostatic as the result of resource-driven shifts in dominance between more homeostatic strains at low resource C:P ratios and highly flexible strains when P is scarce relative to C.

Aquatic Heterotrophic Bacteria Have Highly Flexible Phosphorus Content and Biomass Stoichiometry Godwin, C. M. and J. B. Cotner. 2015

The ISME journal (2015)doi:10.1038/ismej.2015.34

Bacteria are central to the cycling of carbon (C), nitrogen (N) and phosphorus (P) in every ecosystem, yet our understanding of how tightly these cycles are coupled to bacterial biomass composition is based upon data from only a few species. Bacteria are commonly assumed to have high P content, low biomass C:P and N:P ratios, and inflexible stoichiometry. Here, we show that bacterial assemblages from lakes exhibit unprecedented flexibility in their P content (3% to less than 0.01% of

dry mass) and stoichiometry (C:N:P of 28: 7:1 to more than 8500: 1200: 1)

Species Sorting and Seasonal Dynamics Primarily Shape Bacterial Communities in the Upper Mississippi River
Staley, C., T. J. Gould, P. Wang, J. Phillips, J. B. Cotner, and M. J. Sadowsky. 2015
Sci Total Environ505 (2015): doi:10.1016/j.scitotenv.2014.10.012

Bacterial community structure (BCS) in freshwater ecosystems varies seasonally and due to physicochemical gradients, but metacommunity structure of a major river remains understudied. Here we characterize the BCS along the Mississippi River and contributing rivers in Minnesota over three years using Illumina next-generation sequencing, to determine how changes in environmental conditions as well as inputs from surrounding land and confluences impacted community structure.

Physiological Modifications of Seston in Response to Physicochemical Gradients within Lake Superior
Bellinger, B. J., A. S. Benjamin, V. Mooy, J. B. Cotner, H. F. Fredricks, C. R. Benitez-Nelson, J. Thompson, A. Cotter, M. L. Knuth, and C. M. Godwin. 2015
Limnology and Oceanography 59, no. 3 (2014): doi:10.4319/lo.2014.59.3.1011

In September 2011, we investigated the distribution and composition of dissolved and particulate phosphorus (P) pools throughout Lake Superior, a large P-limited freshwater ecosystem. Average seston particulate P (PP) concentrations in the deep chlorophyll maximum (DCM; 85 ± 28 nmol L−1) were significantly greater than in the epilimnion (63 ± 22 nmol L−1). In contrast, average particulate organic carbon (POC) : PP (mol : mol) ratios showed the opposite pattern (DCM = 303 : 1 vs. epilimnion = 455 : 1).

***Patterns and Drivers of Change in Organic Carbon Burial across a Diverse Landscape: Insights from 116 Minnesota Lakes* ;Dietz, R. D., D. R. Engstrom, and N. J. Anderson. 2015**
Global Biogeochem. Cycles, 29, 708–727, doi:10.1002/2014GB004952

Lakes may store globally significant quantities of organic carbon (OC) in their sediments, but the extent to which burial rates vary across space and time is not well described. Using 210Pb-dated sediment cores, we explored patterns of OC burial in 116 lakes spanning several ecoregions and land use regimes in Minnesota, USA during the past 150–200 years.

Main menu

- Home
- About Us
- Our Work
- Training

- News/Events
- Publications
- Extension Water Resources
- WRS Graduate Program
- Water Topics

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu

ll 2015 Upcoming Events

ober 13-14, 2015
nnesota Water Conference

Centre
St. Paul, MN

The Minnesota Water Resources Conference presents innovative, practical, and applied water resource engineering solutions, management techniques, and current research about Minnesota's water resources.

January 28, 2016
Climate Adaptation Conference: Transforming Awareness into Action

DoubleTree by Hilton
Minneapolis North
2200 Freeway Boulevard
Minneapolis, MN 55430
Registration will be posted on wrc.umn.edu mid-October

Main menu

- Home
- About Us
- Our Work
- Training
- News/Events
- Publications

- Extension Water Resources
- WRS Graduate Program
- Water Topics

The Water Resources Center is a unit of the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

Water Resources Center | 173 McNeal Hall | 1985 Buford Avenue | St. Paul, MN 55108
612-624-9282 | umwrc@umn.edu